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Kwan

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(54) **METHOD AND SYSTEM FOR PROVIDING SECURITY USING RFID TAGGED ITEMS EXITING OR ENTERING A RETAIL ESTABLISHMENT**

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(52) **U.S. Cl.** **340/572.1**; 340/572.4; 340/568.1; 340/571; 235/375

(58) **Field of Classification Search** 340/572.1, 340/572.4, 568.1, 570, 825.36, 505, 506, 340/521, 522, 528; 235/375, 385, 383
See application file for complete search history.

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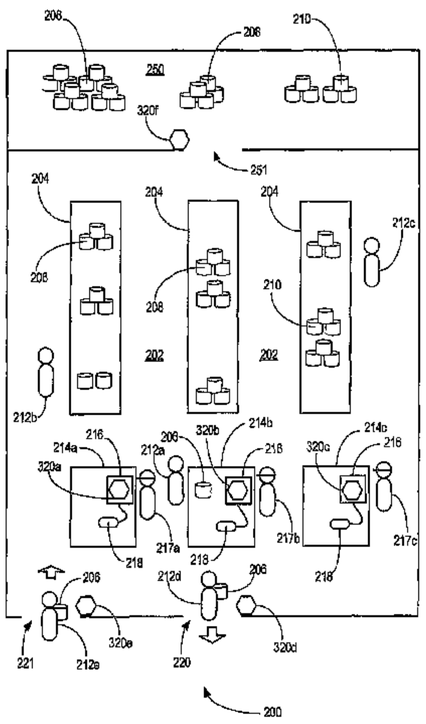
(74) *Attorney, Agent, or Firm*—Schmeiser, Olsen & Watts; William H. Steinberg

(57) **ABSTRACT**

A method or system of providing security utilizing RFID tagged items exiting or entering a retail establishment. A RFID tag value of a RFID tagged item being checked out is: read by a first RFID reader, added to an exit queue, and read by a second RFID reader at an exit of the retail establishment after which it is ascertained that the RFID tag value is or is not in the exit queue respectively resulting in deletion of the RFID tag value from the exit queue or raising a security alert. A RFID tag value of a first RFID tagged item at an entrance of the retail establishment is read by a RFID reader, added to an entrance queue, determined as having come from the retail establishment, and ascertained to have entered the retail establishment to be returned for a refund or exchanged for a second RFID tagged item.

20 Claims, 6 Drawing Sheets



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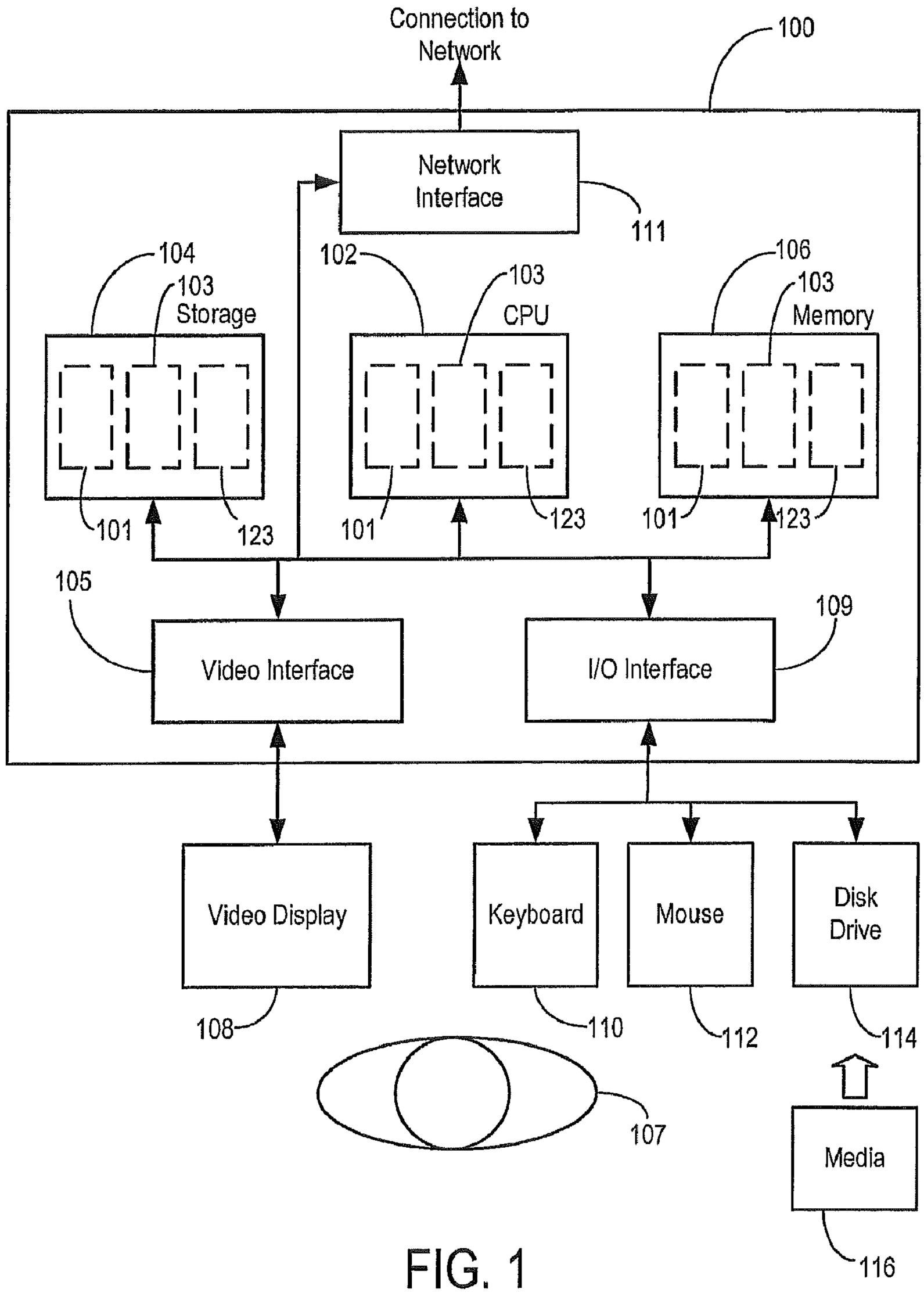
Connection to Network
100
Network Interface
111
104
103
Storage
102
103
CPU
106
103
Memory
101
123
101
123
101
123
105
Video Interface
I/O Interface
109
Video Display
Keyboard
Mouse
Disk Drive
108
110
112
114
107
Media
116

FIG. 1

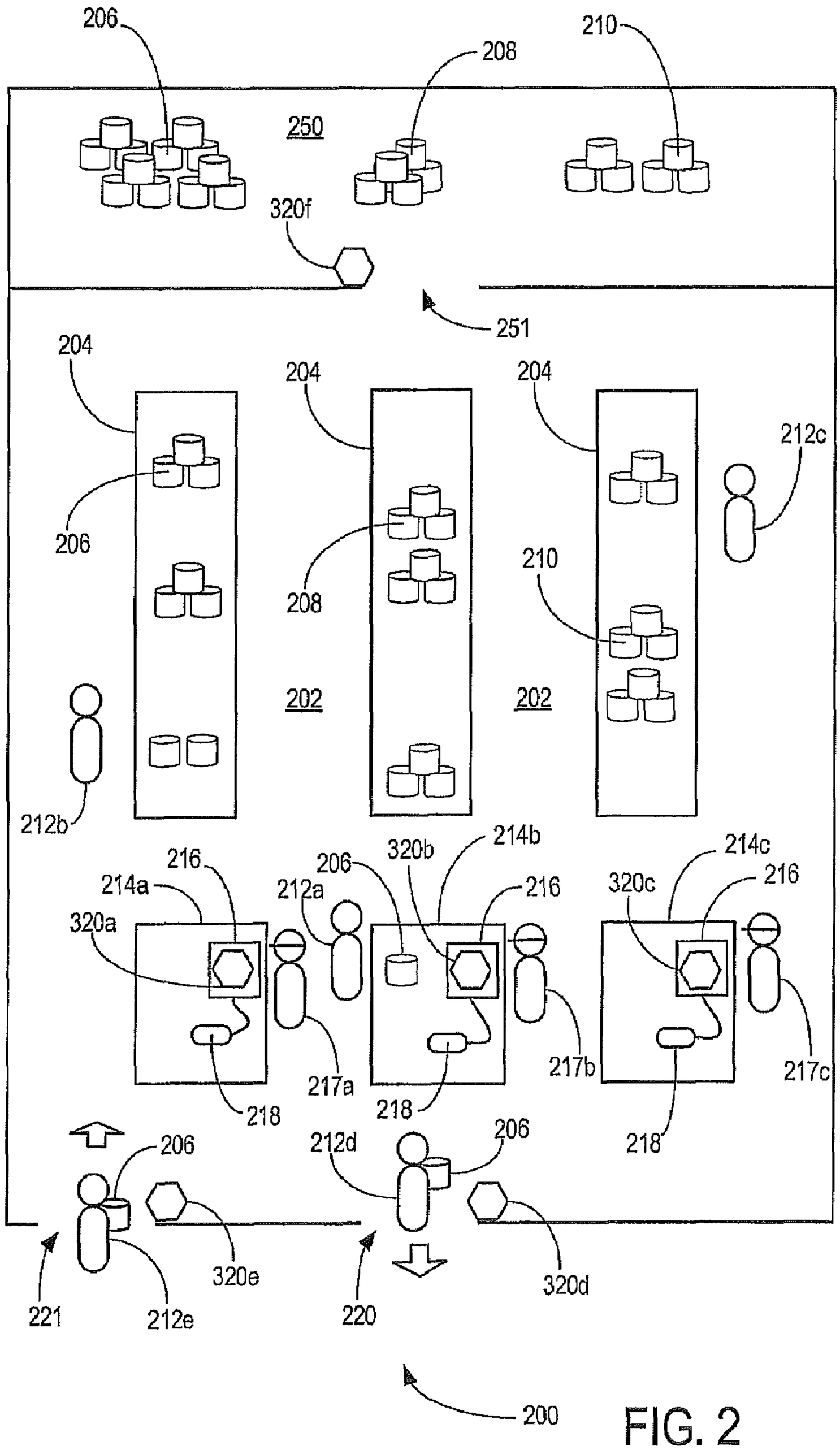
206
208
210
250
320f
251
204
204
204
212c
206
208
210
202
202
212b
216
214a
320a
212a
206
320b
214b
216
214c
320c
216
217a
218
217b
218
217c
218
206
212d
206
320e
320d
221
212e
220
200

FIG. 2

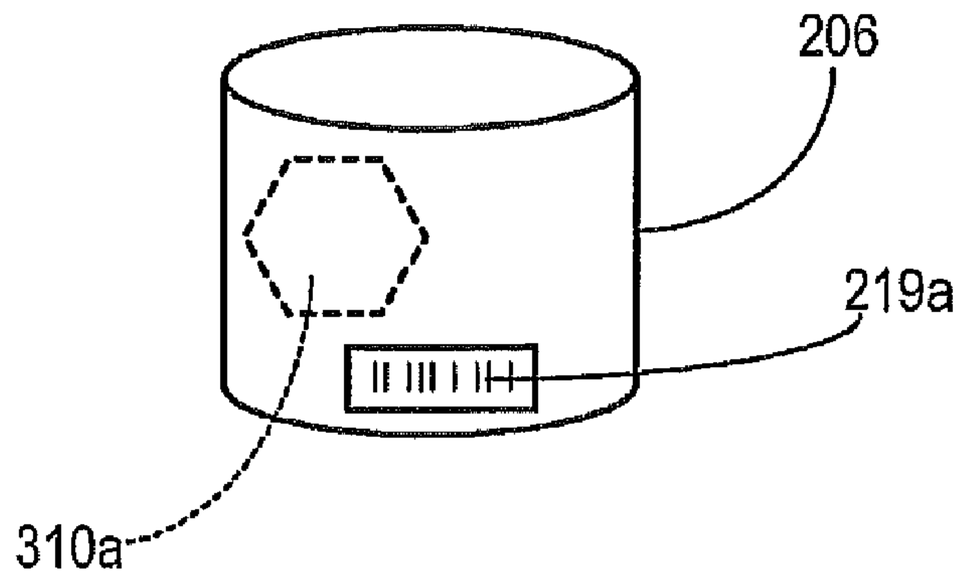

FIG. 3A

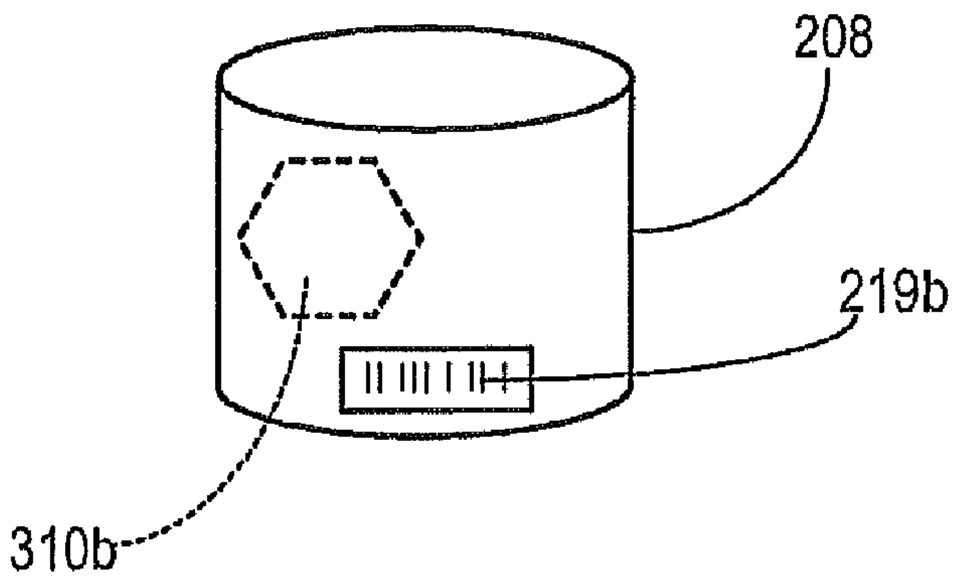

FIG. 3B

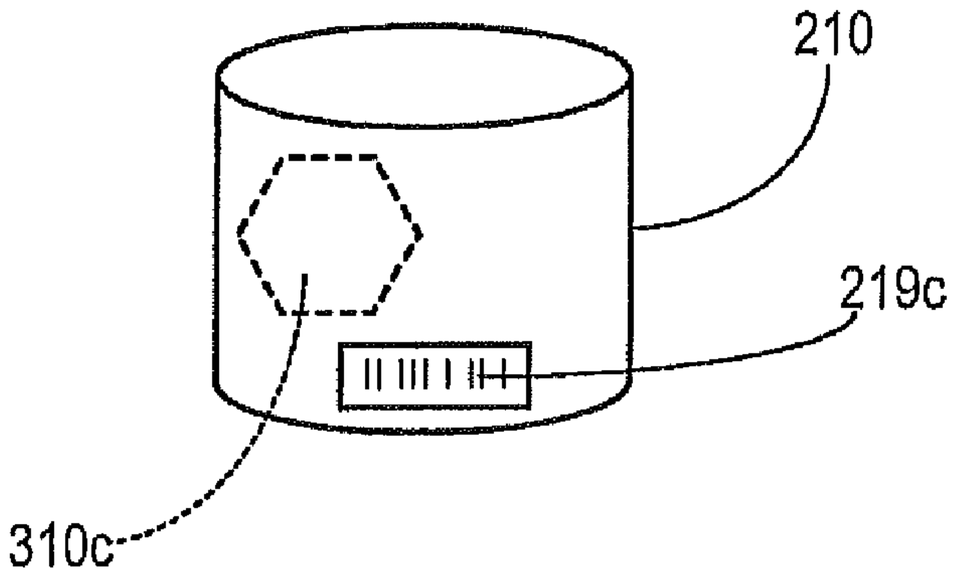

FIG. 3C

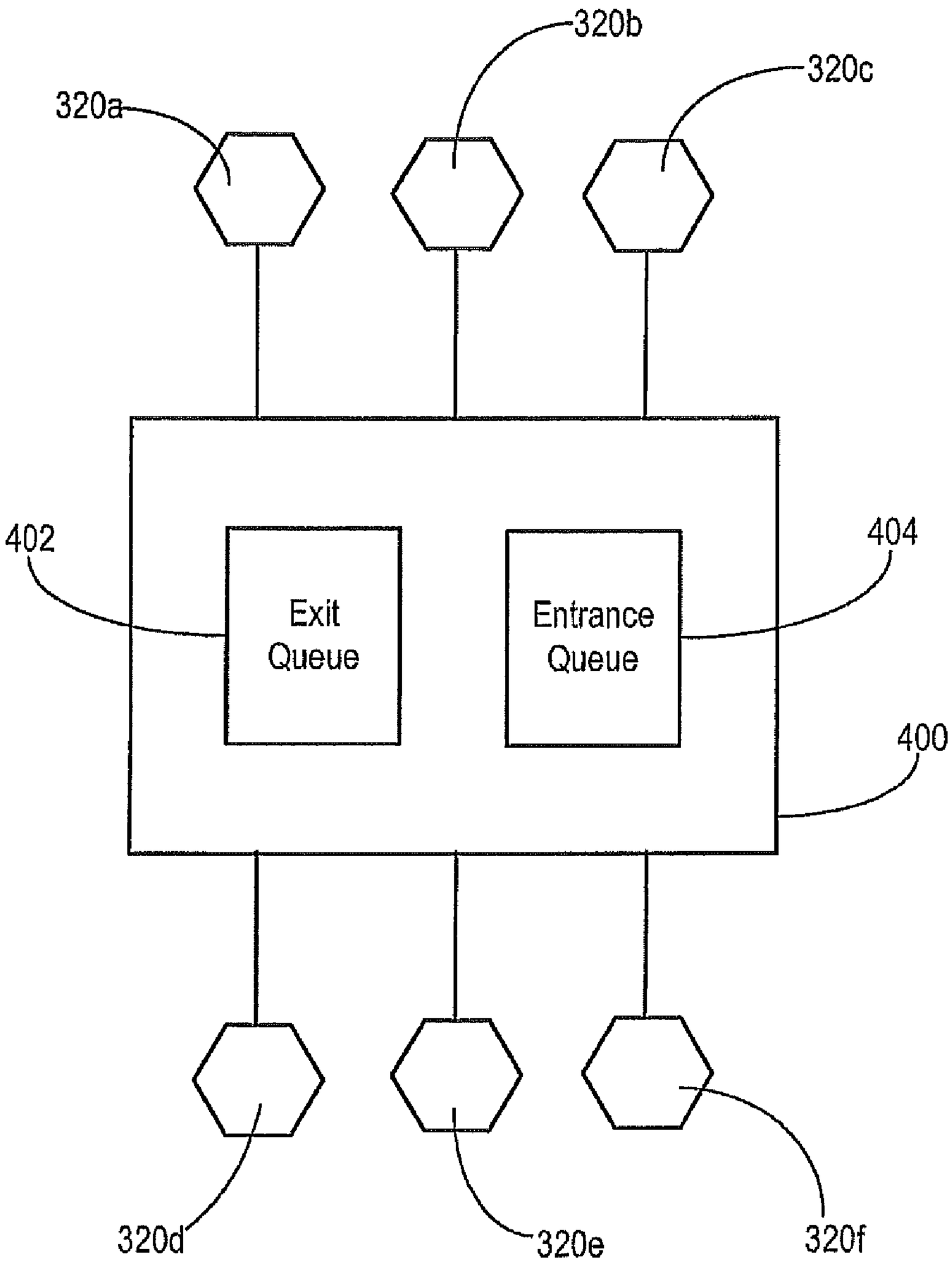
320a
320b
320c
402
Exit Queue
Entrance Queue
404
400
320d
320e
320f

FIG. 4

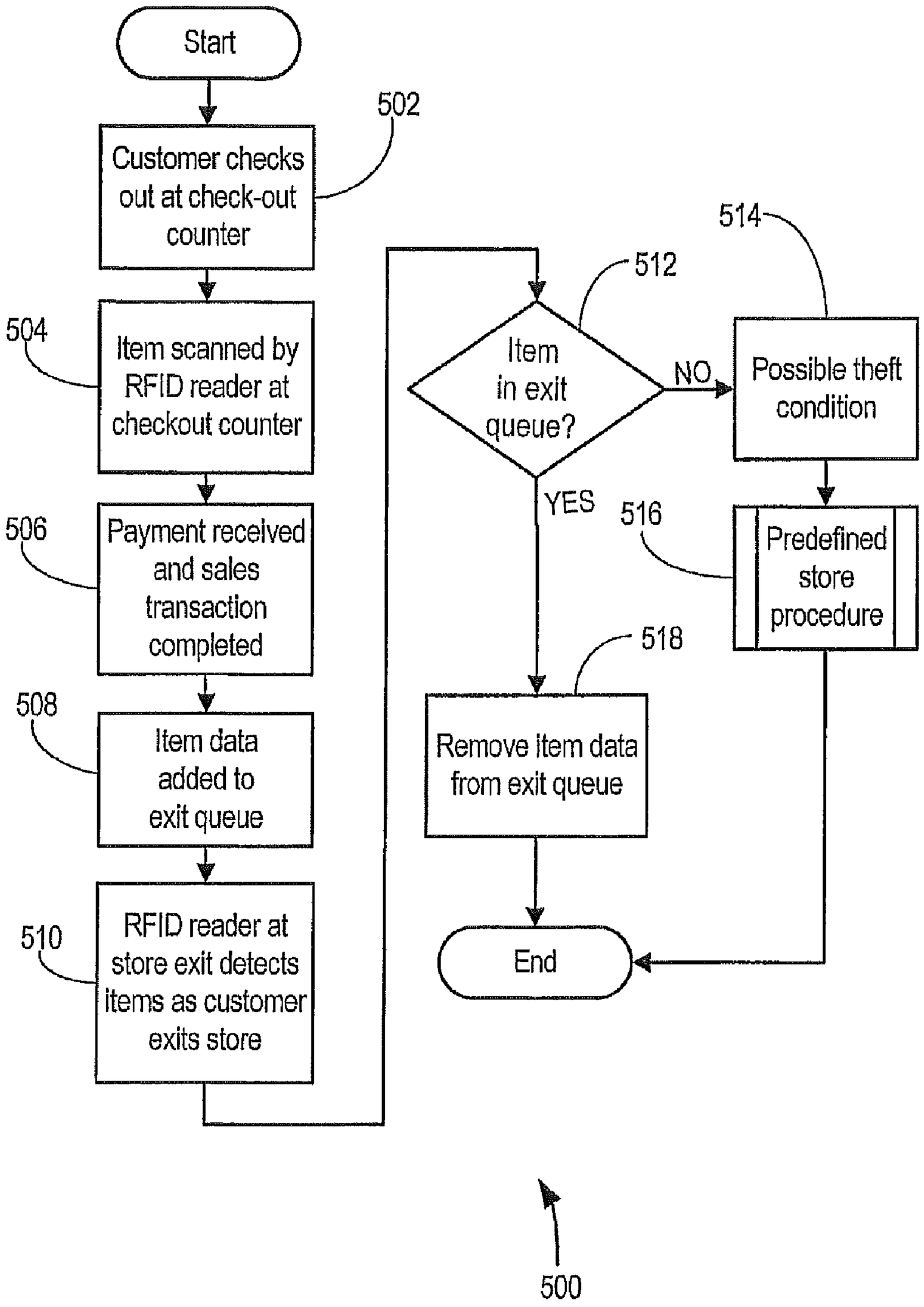
Start
502
Customer checks out at check-out counter
504
Item scanned by RFID reader at checkout counter
506
Payment received and sales transaction completed
508
Item data added to exit queue
510
RFID reader at store exit detects items as customer exits store
512
Item in exit queue?
NO
Possible theft condition
514
YES
516
Predefined store procedure
518
Remove item data from exit queue
End
500

FIG. 5

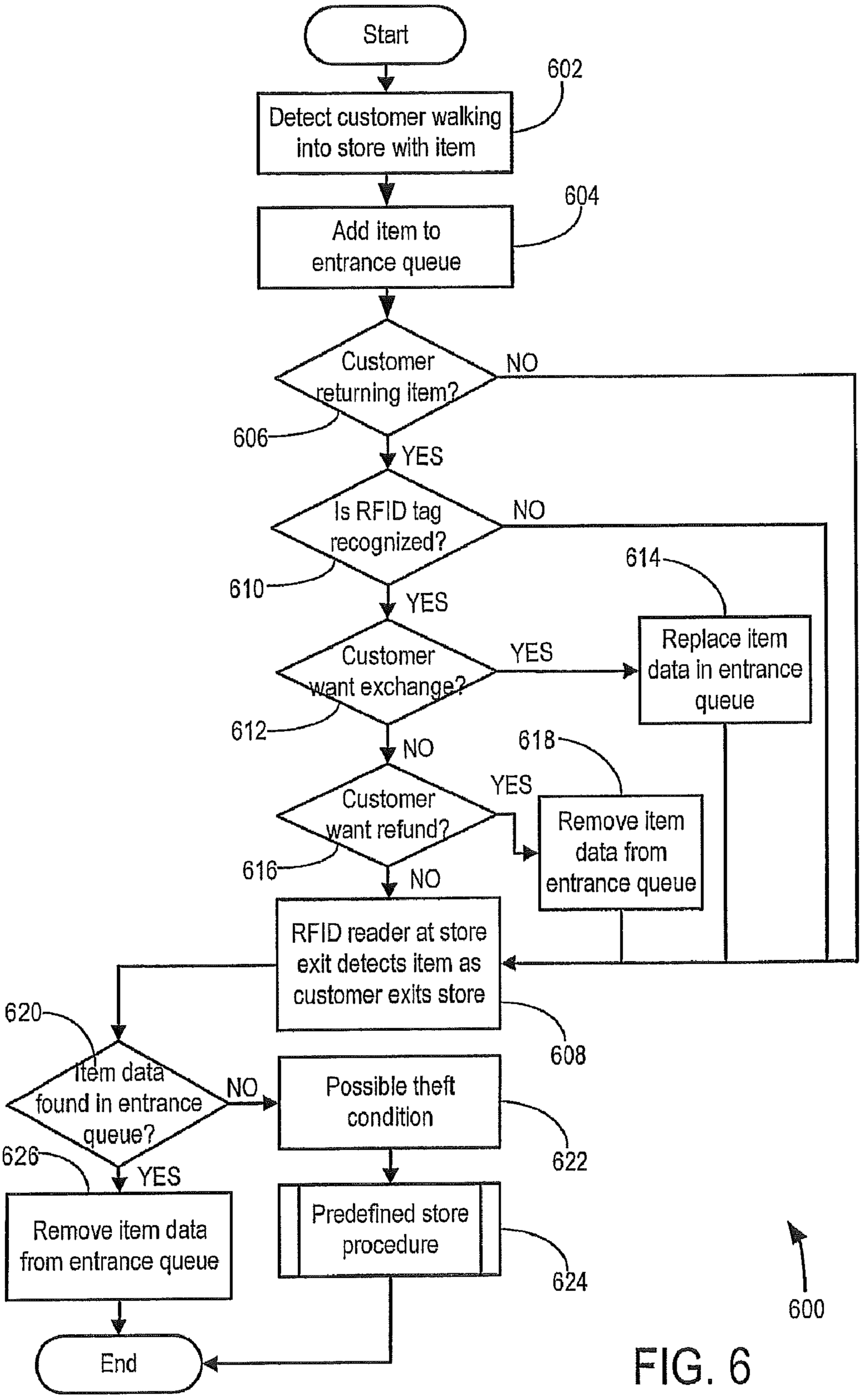
Start
602
Detect customer walking into store with item
604
Add item to entrance queue
Customer returning item?
NO
606
YES
Is RFID tag recognized?
NO
610
YES
614
Customer want exchange?
YES
Replace item data in entrance queue
612
NO
618
Customer want refund?
YES
Remove item data from entrance queue
616
NO
RFID reader at store exit detects item as customer exits store
608
620
Item data found in entrance queue?
NO
Possible theft condition
622
626
YES
Remove item data from entrance queue
Predefined store procedure
624
End
600

FIG. 6

METHOD AND SYSTEM FOR PROVIDING SECURITY USING RFID TAGGED ITEMS EXITING OR ENTERING A RETAIL ESTABLISHMENT

FIELD OF THE INVENTION

The present invention relates to systems and methods for providing security using radio frequency identification (RFID) readers and tags, especially in a retail sales environment.

BACKGROUND OF THE INVENTION

In recent years, RFID tags have been used to track bulk objects such as pallets or boxes of items to help retailers manage the supply chain from their suppliers to their warehouses. As the cost and size of RFID tags decrease, their usage in retail environments is increasing. RFID tags may now be found in individual items, and this has extended the range of supply chain management right to the store shelves. RFID tags may store electronic serial numbers (ESNs), which may allow an individual item to be identified, thereby allowing the tracking of inventory on the shelves and back in the storage room.

Although universal product tags (UPCs) are still predominantly used at point-of-sale (POS) terminals for checkout, it is now possible to use RFID tags to identify the items instead. The RFID tags also offer potential for use in other types of applications, such as security. However, this potential must be balanced with concerns over customer privacy. What is needed is an improved system and method for providing security using RFID, especially in retail environments.

SUMMARY OF THE INVENTION

The present invention provides a method of providing security utilizing radio frequency identification (RFID) tagged items exiting a retail establishment, said retail establishment comprising an exit, at least one checkout counter, a first RFID reader, a second RFID reader, and a processor server comprising a security module that includes an exit queue, said first and second RFID readers being operatively connected to the security module, said security module being configured to respectively add or delete RFID tag values of a RFID tagged item to or from the exit queue upon the RFID tagged item being within a reading range of the first or second RFID reader, said method comprising:

reading a RFID tag value of a RFID tagged item being checked out at a first checkout counter of the at least one checkout counter in a purchasing transaction for the item, said reading the RFID tag value being performed by the first RFID reader;

adding the RFID tag value read by the first RFID reader to the exit queue;

after completion of the purchasing transaction for the item, reading the RFID tag value at the exit by the second RFID reader;

after said reading the RFID tag value by the second RFID reader, ascertaining whether the RFID tag value is in the exit queue;

if said ascertaining ascertains that the RFID tag value is in the exit queue then deleting the RFID tag value from the exit queue, otherwise raising a security alert.

The present invention provides a method of providing security utilizing radio frequency identification (RFID) tagged items entering a retail establishment, said retail establishment comprising an entrance, a RFID reader, and a processor server comprising a security module that includes an entrance queue, said RFID reader being operatively connected to the security module, said security module being configured to add or delete RFID tag values of a RFID tagged item to or from the exit queue upon the RFID tagged item being within a reading range of the RFID reader, said method comprising:

reading a RFID tag value of a first RFID tagged item at the entrance upon the first RFID tagged item entering the retail establishment via the entrance, said reading the RFID tag value being performed by the RFID reader;

adding the RFID tag value read by the RFID reader to the entrance queue;

comparing the RFID tag value read by the RFID reader with a previously stored reference RFID tag value to determine if the first RFID tagged item is recognized as having come from the retail establishment;

determining from said comparing that the first RFID tagged item is recognized as having come from the retail establishment;

ascertaining whether the first RFID tagged item has entered the retail establishment to be returned for a refund or to be exchanged for a second RFID tagged item that differs from the first RFID tagged item;

if said ascertaining ascertains that the first RFID tagged item has entered the retail establishment to be returned for a refund then deleting the RFID tag value from the entrance queue;

if said ascertaining ascertains that the first RFID tagged item has entered the retail establishment to be exchanged for the second RFID tagged item then replacing in the entrance queue the RFID tag value of the first RFID tagged item with a different RFID tag value of the second RFID tagged item.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a generic data processing system that may provide a suitable operating environment.

FIG. **2** shows an illustrative retail RFID environment.

FIGS. **3**A to **3**C show illustrative items with RFID tags.

FIG. **4** shows an illustrative security system in accordance with an embodiment.

FIG. **5** shows a flowchart of an illustrative sales method in accordance with an embodiment.

FIG. **6** shows a flowchart of an illustrative refund/exchange method in accordance with an embodiment.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a system and method for providing security using RFID, especially in retail sales environments.

In an aspect of the invention, there is provided a method of providing security utilizing radio frequency identification (RFID) tagged items, comprising: reading an RFID tag value of an item at a checkout counter utilizing a first RFID reader; adding the read RFID tag value to an exit queue; reading the RFID tag value at an exit utilizing a second RFID reader; and deleting the RFID tag value from the exit queue after the second RFID reader reads the RFID tag value.

In an embodiment, the method further comprises adding the read RFID tag value to the exit queue after completion of a purchasing transaction for the item.

In another embodiment, the method further comprises introducing a delay after the completion of the purchasing

transaction for the item, and before the read RFID tag value for the item is added to the exit queue.

In another embodiment, the method further comprises adjusting the delay according to the average duration of time expected between the completion of the purchasing transaction for the item, and the reading of the RFID tag value at the exit.

In another embodiment, the method further comprises raising a security alert if an RFID tag value is detected at the exit without that RFID tag value being stored in the exit queue.

In another embodiment, the method further comprises providing an RFID tag value that is identical for all items of the same kind, unique for each item of the same kind, or randomly selected from a predetermined range of possible values for items of the same kind.

In another embodiment, the method further comprises: reading an RFID tag value of an item at an entrance utilizing a third RFID reader; adding the read RFID tag value to an entrance queue; and comparing the read RFID tag value with a previously stored reference RFID tag value to determine if the item is recognized as having come from the store.

In another embodiment, the method further comprises replacing the RFID tag value in the entrance queue with an RFID tag value for another item provided in exchange.

In another embodiment, the method further comprises deleting the RFID tag value from the entrance queue if the item is returned.

In another aspect of the invention, there is provided a system for providing security utilizing radio frequency identification (RFID) tagged items, the system including a security module configured to: read an RFID tag value of an item at a checkout counter utilizing a first RFID reader; add in an exit queue the read RFID tag value; read an RFID tag value of an item at an exit utilizing a second RFID reader; and delete from the exit queue the RFID tag value after the second RFID reader reads the RFID tag value.

In another embodiment, the security module is further configured to add the RFID tag value to the exit queue only after completion of a purchasing transaction for the item.

In another embodiment, the security module is further configured to introduce a delay after the completion of the purchasing transaction, and before the RFID tag value for the item is added to the exit queue.

In another embodiment, the security module is further configured to adjust the delay according to the average duration of time expected between the completion of the purchasing transaction, and the reading of the RFID tag value at the exit.

In another embodiment, the security module is further configured to raise a security alert if an RFID tag value is detected at the exit without that RFID tag value being stored in the exit queue.

In another embodiment, the security module is further configured to read an RFID tag value that is identical for all items of the same kind, unique for each item of the same kind, or randomly selected from a predetermined range of possible values for items of the same kind.

In another embodiment, the security module is further configured to: read an RFID tag value of an item at an entrance utilizing a third RFID reader; add the read RFID tag value to an entrance queue; compare the read RFID tag value with a previously stored reference RFID tag value to determine if the item is recognized as having come from the store.

In another embodiment, the security module is further configured to replace the RFID tag value in the entrance queue with an RFID tag value for another item provided in exchange.

In another embodiment, the security module is further configured to delete the RFID tag value from the entrance queue if the item is returned.

In another aspect of the invention, there is provided a data processor readable medium storing data processor code that, when loaded into a data processing device, adapts the device to provide security utilizing radio frequency identification (RFID) tagged items, the data processor readable medium comprising: code for reading an RFID tag value of an item at a checkout counter utilizing a first RFID reader; code for adding the read RFID tag value to an exit queue; code for reading the RFID tag value at an exit utilizing a second RFID reader; and code for deleting the RFID tag value from the exit queue after the second RFID reader reads the RFID tag value.

In an embodiment, the data processor readable medium further comprises code for adding the RFID tag value to the exit queue after completion of a purchasing transaction for the item.

In another embodiment, the data processor readable medium further comprises code for introducing a delay after the completion of the purchasing transaction, and before the RFID tag value for the item is added to the exit queue.

In another embodiment, the data processor readable medium further comprises code for adjusting the delay according to the average duration of time expected between the completion of the purchasing transaction, and the reading of the RFID tag value at the exit.

In another embodiment, the data processor readable medium further comprises code for raising a security alert if an RFID tag value is detected at the exit without that RFID tag value being stored in the exit queue.

In another embodiment, the data processor readable medium further comprises code for reading an RFID tag value of an item at an entrance utilizing a third RFID reader; code for adding the read RFID tag value to an entrance queue; and code for comparing the read RFID tag value with a previously stored reference RFID tag value to determine if the item is recognized as having come from the store.

In another embodiment, the data processor readable medium further comprises code for replacing the RFID tag value in the entrance queue with an RFID tag value for another item provided in exchange.

In another embodiment, the data processor readable medium further comprises code for deleting the RFID tag value from the entrance queue if the item is returned.

As noted above, the present invention relates to a system and method for providing security using RFID, especially in retail sales environments.

The invention may be practiced in various embodiments. A suitably configured data processing system, and associated communications networks, devices, software and firmware may provide a platform for enabling one or more of these systems and methods. By way of example, FIG. **1** shows a generic data processing system **100** that may include a central processing unit ("CPU") **102** connected to a storage unit **104** and to a random access memory **106**. The CPU **102** may process an operating system **101**, application program **103**, and data **123**. The operating system **101**, application program **103**, and data **123** may be stored in storage unit **104** and loaded into memory **106**, as may be required. An operator **107** may interact with the data processing system **100** using a video display **108** connected by a video interface **105**, and various input/output devices such as a keyboard **110**, mouse **112**, and disk drive **114** connected by an I/O interface **109**. In known manner, the mouse **112** may be configured to control movement of a cursor in the video display **108**, and to operate various graphical user interface ("GUI") controls appearing

in the video display **108** with a mouse button. The disk drive **114** may be configured to accept data processing system readable media **116**. The data processing system **100** may form part of a network via a network interface **111**, allowing the data processing system **100** to communicate with other suitably configured data processing systems (not shown). The particular configurations shown by way of example in this specification are not meant to be limiting.

Now referring to FIG. **2**, shown is an illustrative retail RFID environment **200**. As shown, retail RFID environment **200** may include a store floor **202** with shelves **204**, holding various items **206**, **208**, **210**. Additional items **206**, **208**, **210** may be stored in a storage area **250** accessible via a storage room access **251** in order to replenish items **206**, **208**, **210** on the store shelves **204** when customers **212***a*, **212***b*, **212***c* (collectively customers **212**) pick the items **206**, **208**, **210** up for purchase. Items **206**, **208**, **210** may include conventional UPC labels, and may further include RFID tags in various configurations as will be explained in more detail further below with reference to FIGS. **3**A to **3**C.

Still referring to FIG. **2**, checkout counters **214***a*, **214***b*, **214***c* may be provided near the store exit **220** so that customers **212** may pay for their purchases. While the exit **220** may be configured to also serve as an entrance, a separate entrance **221** may be provided. Checkout counters **214***a*, **214***b*, **214***c* (collectively checkout counters **214**) may have POS terminals **216** that may be attended by cashiers **217***a*, **217***b*, **217***c*. POS terminals **216** may be suitably configured data processing systems (e.g. data processing system **100** or selected components thereof) that may communicate with a back-end data processing system (e.g. another data processing system **100** configured as a server) over a network (not shown).

As shown, POS terminals **216** may also be configured with optical readers **218** for reading UPC labels on items **206**, **208**, **210**. POS terminals **216** may further be configured with RFID readers **320***a*, **320***b*, **320***c* (collectively RFID readers **320**) for sensing RFID tags. In an alternative configuration, if checkout counters **214***a*, **214***b*, **214***c* are configured as self-serve checkout stations, then cashiers **217***a*, **217***b*, **217***c* need not be present.

In an embodiment, another RFID reader **320***d* may be provided near the store exit **220** to detect items **206**, **208**, **210** as they pass by. Other RFID readers may be provided in various locations, such as at the store entrance **221** (RFID reader **320***e*), and at the storage room access **251** (RFID reader **320***f*).

Now referring to FIGS. **3**A to **3**C, shown are illustrative items **206**, **208**, **210** having RFID tags **310***a*, **310***b*, **310***c* (collectively RFID tags **310**). As shown, each of the items **206**, **208**, **210** may also include UPC labels **219***a*, **219***b*, **219***c* (collectively UPC labels **219**) which may be read by the optical readers **218** shown in FIG. **2**. In conventional manner, items **206**, **208**, **210** may be identified by these UPC labels **219** for the purposes of retrieving pricing information and calculating a total bill for a customer's purchases. Alternatively, items **206**, **208**, **210** may be tracked at the checkout counters **214** via their RFID tags **310***a*, **310***b*, **310***c*.

For the purposes of the present discussion, consider that each item **206**, **208**, **210** may include RFID tags **310***a*, **310***b*, **310***c* that may be configured differently. For example, item **206** may include an RFID tag **310***a* with a value that is common to all items **206**. That is, RFID tag **310***a* may provide no more information than a UPC label **219** that is common to all items **206**. In this case, the RFID tag **310***a* may be used in lieu of the UPC label **219** for the purposes of retrieving pricing information, but does not link a particular item **206** to a particular customer (e.g. to customer **212***a*).

Now consider item **208** which may include an RFID tag **310***b* that includes a value that is unique to that particular item **208** (e.g. a unique electronic serial number or ESN). In this case, if this RFID tag **310***b* is read by an RFID reader **320** at a checkout counter **214**, it is possible to link a particular item **208** to a particular customer if the customer is using some form of debit/credit/rewards card. This may provide the highest level of security by linking a particular item to a particular client, but it may also raise some privacy issues.

Finally, consider item **210** which may include an RFID tag **310***c* that includes a random value, but which is not unique. As an example, consider a factory production volume of ten million pieces for item **210**, and a shipment to a particular store containing about 10,000 pieces of item **210**. Suppose that, at one time, there is no more than 1,000 pieces of item **210** that may be on the store floor **202**. In this case, a predetermined range of 3 digits (e.g. from 000 to 999) randomly assigned to items **210** may be enough. There may then be approximately a $\frac{1}{1000}$ chance a shoplifter may pick up an item that has the same RFID tag value as another item stored in an exit queue when purchased (as will be explained further below). In a random sample of 1000 items, there will be some chance of having items **210** with duplicated RFID tag values on the floor **202**. However, the actual number of items that pass through checkout and toward the exit **220** may only be several items an hour. Thus, the risk would be minimal. While this approach provides an enhanced level of security, a level of anonymity is also provided to customers based on the randomness of the RFID tag values.

Now referring to FIG. **4**, shown is an illustrative security module **400**, which may be embodied in a back-end data processor server (such as an appropriately configured data processor **100** of FIG. **1**). As shown in FIG. **4**, security module **400** may include queues **402** and **404**. Security module **400** may also be operatively connected to each RFID reader **320***a*, **320***b*, **320***c* provided at the checkout counters **214***a*, **214***b*, **214***c*, respectively, and also to RFID reader **320***d* provided at the exit **220**. Furthermore, RFID reader **320***e* provided at the entrance **221**, and RFID reader **320***f* may also linked to security module **400**. Security module **400** may be configured to add or delete items from the queues **402**, **404** as items **206**, **208**, **210** pass by within the reading range of certain RFID readers **320**.

As will now be explained by reference to some examples The various configurations for the RFID tags **310***a*, **310***b*, **310***c* as described above, may provide a user of queuing system **400** with significant flexibility in balancing security and customer privacy in a retail environment.

As a first example, consider a customer **212***a* that is purchasing an item **206** having an RFID tag **310***a* at checkout counter **214***b*. In this example, the RFID tag **310***a* carries only the equivalent of a UPC label for each item, and does not contain any uniquely identifiable information. When customer **212***a* is checking out item **206** at a checkout counter **214***b*, only the equivalent of UPC information will be read by the RFID reader **320**.

At the checkout counter **214***b*, the RFID tag **310***a* in item **206** may be scanned by RFID reader **320***a* and the identifying value may be used to retrieve pricing information for item **206**. Once scanned, item **206** may be added to an exit queue **402** by security module **400**. In an embodiment, this exit queue **402** may contain items that have been paid for, but which have not yet left the store. As a customer **212***a* leaves the store (e.g. as shown by the position of customer **212***d*), item **206** with RFID tag **310***a* may be detected at the exit **220** by RFID reader **320***d*, and may be removed from the exit queue **402**. If an item **206** is detected at the exit **220** but is not

in the exit queue **402**, this condition may be interpreted as a possible theft condition, and an alarm may be triggered.

However, in this example, there is a chance that a legitimate customer may trigger an alarm condition if someone else removes the same item **206** from the store floor **202** after customer **212***a* has completed payment but before customer **212***a* has exited the store.

To reduce the possibility of this false alarm condition, in an embodiment, a suitable delay may be introduced after the purchasing transaction is completed and before the purchased item(s) is/are added to exit queue **402**. For example, if it will take an average of ten seconds before a customer **212***a* can leave the checkout counter **214***b* to reach the nearest exit **220**, then a suitable time delay may be added (e.g. seven or eight seconds).

In an embodiment, in order to account for the variable distance between each checkout counter **214***a*, **214***b*, **214***c* and the exit **220**, a variable delay may be added depending on which checkout counter **214***a*, **214***b*, **214***c* a customer is leaving from to reach the exit **220**.

In another embodiment, a time-to-live (TTL) interval can be added before items are added to exit queue **402** to cover a situation where RFID tag **310***a* is not detected at the exit **220** within a reasonable amount of time. For example, if an item **206** is not detected by RFID reader **320***d* at exit **220** within 15 minutes, the item **206** may be cleared from the exit queue **402**. As another example, the entire exit queue **402** may be cleared as the store closes for the day.

In yet another example, the item being purchased may be item **210**, with each RFID tag **310***c* storing a random, but not unique, string. Preferably, the random range of the string should be sufficient to identify each item at one time (in the queue for example) but not unique enough to identify each item in a shipment, for example. This may provide a more reasonable balance between security and customer privacy. With this embodiment, false alarm conditions may be further reduced, as the item **210** will have a random, although not unique, ID string. With a sufficient random range (e.g. a value of between 000 and 999), the likelihood of someone removing an item **210** that has the same random string will be remote.

Now referring to FIG. **5**, shown is a flowchart of an illustrative sales method **500**, as may be embodied and practiced in security module **400** of FIG. **4**. Method **500** begins at block **502**, as a customer (e.g. customer **212***a*) checks out at a checkout counter (e.g. checkout counter **214***b*). At block **504**, an item (e.g. item **206**) is scanned by an RFID reader (e.g. RFID reader **320***b*). At block **506**, payment for the item is received, and the sales transaction is completed at the checkout counter **214***b*.

Next, at block **508**, method **508** adds item data to a queue (e.g. exit queue **402**), containing the RFID value read at the checkout counter **214***b*. As noted earlier, an appropriate delay may be introduced before item data is added to the exit queue **402** in order to reduce the likelihood of a potential false alarm condition.

Method **500** then proceeds to block **510** where another RFID reader (e.g. RFID reader **320***d*) reads an RFID tag (e.g. RFID tag **310***a*) in the item **206**. Method **500** then proceeds to decision block **512** where method **500** determines if the predetermined delay has been reached. If yes, method **500** proceeds directly to block **518**, where method **500** removes the data for item **206** from exit queue **402**.

If no, method **500** proceeds to block **514**, where method **500** may alert security of a possible theft condition. Method **500** may then proceed to block **516**, where the store's predefined procedure for investigating the possible theft condition may be implemented to determine if there may be a theft, or a false alarm. Method **500** then ends.

In another embodiment, RFID reader **320***e* at the entrance **221** can be used to detect when an item is being returned to the store (e.g. for a refund or exchange) by a returning customer **212***e*. As shown in FIG. **4**, security module **400** may be configured to handle items returning to the store using an entrance queue **404**.

As an item is returned to the store, the RFID tag (**310***a*, **310***b*, or **310***c*) on the returning item may determine how much information may be retrieved. For example, if the returning item is item **206** with common values for all RFID tags **310***a*, no further information may be retrieved as to the identity of the returning customer **212***e*.

In contrast, if the returning item is item **208** with an ESN that is linked to customer information and uniquely identifies the customer **212***e* who purchased it, then specific information about that item may be retrieved (e.g. what date the item **208** was purchased, and whether the return is being attempted within the allowable return period). With this level of information, the store may be able to determine if a return is being attempted outside of the allowable return period, for example, or if an entirely different item **208** is being returned. It will be appreciated that this may allow the store to more effectively manage and enforce its return policy, and avoid accepting inappropriate returns. However, this may raise some privacy issues.

In another embodiment, if the item being returned is item **210** with a random but not unique value, the item **210** cannot be uniquely identified and linked to a particular customer **212***e*. However, if the random but unique value is linked to the original purchasing transaction (e.g. via a reference number on the receipt), then if someone is trying to return a different item, the likelihood of detecting this may be relatively high given the relatively low probability of having items with the same random value.

A flowchart of an illustrative refund/exchange method **600** as may be embodied and practiced in security module **400** (FIG. **4**) is now shown in FIG. **6**. Method **600** starts and at block **602** detects a customer walking into the store with an item **206** (e.g., by detecting RFID tag **310***a* in item **206** as customer **212***e* passes RFID reader **320***e* at store entrance **221**).

Method **600** then proceeds to block **604**, where item data for item **206** is added to an entrance queue (e.g. entrance queue **404**). Method **600** then proceeds to decision block **606**, where method **600** determines if a customer is trying to return an item **206** by comparing the RFID tag value of the detected RFID tag **310***a* with a previously stored reference RFID tag value to determine if the item **206** is recognized as having come from the store. If no, method **600** may proceed to block **608**. If yes, method **600** may proceed to decision block **610** to determine if the RFID tag can be recognized as one that may have come from the store. If no, method **600** proceeds to block **608**. If yes, method **600** proceeds to decision block **612**.

At decision block **612**, method **600** tries to determine if the item has been returned for an exchange. If yes, method **600** proceeds to block **614**, where the data for item **206** in entrance queue **404** may be replaced with another item (perhaps having a different RFID tag value). If no, method **600** proceeds to decision block **616**, where method **600** tries to determine if the item has been returned for a refund. If yes, method **600** proceeds to block **618**, where data for item **206** is removed from entrance queue **404**. If no, method **600** proceeds to block **608**, where RFID reader **320***d* may pick up the RFID tag value of item **206** as the customer re-exits the store at exit.

Method **600** then proceeds to decision block **620**, where method **600** may determine if data for item **206** is found in the entrance queue **404**. If yes, method **600** proceeds to block **626**, where data for item **206** is removed from the entrance queue **404**.

If no, method **600** proceeds to block **622**, where method **600** may alert store security to a possible theft condition. Method **600** then proceeds to block **624**, where predetermined store procedures for investigating a possible theft condition may be followed. Method **600** then ends.

While particular embodiments of the present invention have been described herein for purposes of illustration, many modifications and changes will become apparent to those skilled in the art. Accordingly, the appended claims are intended to encompass all such modifications and changes as fall within the true spirit and scope of this invention.

What is claimed is:

1. A method of providing security utilizing radio frequency identification (RFID) tagged items exiting a retail establishment, said retail establishment comprising an exit, at least one checkout counter, a first RFID reader, a second RFID reader, and a processor server comprising a security module that includes an exit queue, said first and second RFID readers being operatively connected to the security module, said security module being configured to respectively add or delete RFID tag values of a RFID tagged item to or from the exit queue upon the RFID tagged item being within a reading range of the first or second RFID reader, said method comprising:

reading a RFID tag value of a RFID tagged item being checked out at a first checkout counter of the at least one checkout counter in a purchasing transaction for the item, said reading the RFID tag value being performed by the first RFID reader;

adding the RFID tag value read by the first RFID reader to the exit queue;

after completion of the purchasing transaction for the item, reading the RFID tag value at the exit by the second RFID reader;

after said reading the RFID tag value by the second RFID reader, ascertaining whether the RFID tag value is in the exit queue;

if said ascertaining ascertains that the RFID tag value is in the exit queue then deleting the RFID tag value from the exit queue, otherwise raising a security alert.

2. The method of claim **1**, wherein said ascertaining ascertains that the RFID tag value is in the exit queue.

3. The method of claim **1**, wherein said ascertaining ascertains that the RFID tag value is not in the exit queue.

4. The method of claim **1**, wherein said adding the RFID tag value read by the first RFID reader to the exit queue is performed after said completion of the purchasing transaction for the item.

5. The method of claim **4**, said method further comprising introducing a time delay after said completion of the purchasing transaction for the item and before said adding the RFID tag value read by the first RFID reader to the exit queue.

6. The method of claim **5**, wherein the time delay is less than an average duration of time expected for a customer to leave the first checkout counter and arrive at the exit.

7. The method of claim **6**, wherein the at least one checkout counter consists of a plurality of checkout counters, and the method further comprises:

prior to said introducing the time delay, computing the time delay in consideration of a distance between the first checkout counter and the exit.

8. The method of claim **1**, wherein the RFID tag value of the RFID tagged item and the RFID tag value for all other RFID tagged items in the retail establishment which are the same as the RFID tagged item are a same RFID tag value.

9. The method of claim **1**, wherein the RFID tag value of the RFID tagged item is unique to the RFID tagged item with respect to all other RFID tagged items in the retail establishment.

10. The method of claim **1**, wherein the RFID tag value of the RFID tagged item comprises a random number randomly selected from a specified range of numbers, and wherein all other RFID tagged items in the retail establishment which are the same as the RFID tagged item likewise comprise a random number randomly selected from the specified range of numbers.

11. A system comprising at least one processing unit and at least one computer readable memory unit coupled to the at least one processor, said at least one memory unit containing program code that when executed by the at least one processing unit implement the method of claim **1**, wherein the system comprises the processor server, the first RFID reader, and the second RFID reader.

12. A computer program product, comprising a computer usable storage media having computer readable program code stored thereon, wherein the program code when executed on the at least one processor performs the method of claim **1**.

13. A method of providing security utilizing radio frequency identification (RFID) tagged items entering a retail establishment, said retail establishment comprising an entrance, a RFID reader, and a processor server comprising a security module that includes an entrance queue, said RFID reader being operatively connected to the security module, said security module being configured to add or delete RFID tag values of a RFID tagged item to or from the exit queue upon the RFID tagged item being within a reading range of the RFID reader, said method comprising:

reading a RFID tag value of a first RFID tagged item at the entrance upon the first RFID tagged item entering the retail establishment via the entrance, said reading the RFID tag value being performed by the RFID reader;

adding the RFID tag value read by the RFID reader to the entrance queue;

comparing the RFID tag value read by the RFID reader with a previously stored reference RFID tag value to determine if the first RFID tagged item is recognized as having come from the retail establishment;

determining from said comparing that the first RFID tagged item is recognized as having come from the retail establishment;

ascertaining whether the first RFID tagged item has entered the retail establishment to be returned for a refund or to be exchanged for a second RFID tagged item that differs from the first RFID tagged item;

if said ascertaining ascertains that the first RFID tagged item has entered the retail establishment to be returned for a refund then deleting the RFID tag value from the entrance queue;

if said ascertaining ascertains that the first RFID tagged item has entered the retail establishment to be exchanged for the second RFID tagged item then replacing in the entrance queue the RFID tag value of the first RFID tagged item with a different RFID tag value of the second RFID tagged item.

14. The method of claim **13**, wherein said ascertaining ascertains that the first RFID tagged item has entered the retail establishment to be returned for the refund.

15. The method of claim 13, wherein said ascertaining ascertains that the first RFID tagged item has entered the retail establishment to be exchanged for the second RFID tagged item.

16. The method of claim 13, wherein the first RFID tag value of the first RFID tagged item and the RFID tag value for all other RFID tagged items in the retail establishment which are the same as the first RFID tagged item are a same RFID tag value.

17. The method of claim 13, wherein the first RFID tag value of the first RFID tagged item is unique to the first RFID tagged item with respect to all other RFID tagged items in the retail establishment.

18. The method of claim 13, wherein the first RFID tag value of the first RFID tagged item comprises a random number randomly selected from a specified range of numbers, and wherein all other RFID tagged items in the retail establishment which are the same as the first RFID tagged item likewise comprise a random number randomly selected from the specified range of numbers.

19. A system comprising at least one processing unit and at least one computer readable memory unit coupled to the at least one processor, said at least one memory unit containing program code that when executed by the at least one processing unit implement the method of claim 13, wherein the system comprises the processor server and the RFID reader.

20. A computer program product, comprising a computer usable storage media having computer readable program code stored thereon, wherein the program code when executed on the at least one processor performs the method of claim 13.

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